REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:7911090497 DOC.DATE: 79/11/01 NOTARIZED: NO DOCKET #
FACIL:50-250 Turkey Point Plant, Unit 3, Florida Power and Light C 05000250
50-251 Turkey Point Plant, Unit 4, Florida Power and Light C 05000251
AUTH.NAME AUTHOR AFFILIATION
UHRIG,R.E. Florida Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
O'REILLY,J.P. Region 2, Atlanta, Office of the Director

SUBJECT: Forwards pages of "Nonradiological Environ Monitoring Rept, for Jul-Dec 1978," omitted from 790329 submittal.
PAGES INSERTED CCP 11-26-79.
DISTRIBUTION CODE: A007S COPIES RECEIVED:LTR L ENCL L SIZE: 1+15
TITLE: Annual Environ. Reports (OL Stage)

NOTES:

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
ACTION:	05 BC ORB#1	7	7			
INTERNAL:	01 REG FILE	1	1	02 NRC PDR	1	1
	12 I&E	2	2	14 EEB	1	1
	15 ENVN SPEC BR	1	1	16 EFLT TRT SYS	1	1
	17 RAD ASMT BR	1	1	18 EPS BR SD	1	1
EXTERNAL:	03 LPDR	1	1	04 NSIC	1	1
	19 ACRS	1	1			

— Enviro —
1

CCP

NOV 14 1979

TOTAL NUMBER OF COPIES REQUIRED: LTTR 19 ENCL 19

P.O. BOX 529100, MIAMI, FL 33152

FLORIDA POWER & LIGHT COMPANY

November 1, 1979
L-79-314

Mr. J. P. O'Reilly, Director, Region II
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
101 Marietta Street, Suite 3100
Atlanta, Georgia 30303

Dear Mr. O'Reilly:

Re: Turkey Point Units 3 & 4
Docket Nos. 50-250 and 50-251
Non-Radiological Environmental Monitoring
Report No. 12, Supplemental Report

FPL submitted the Non-Radiological Environmental Monitoring Report for Turkey Point Units 3 and 4 for the period July 1, 1978 through December 31, 1978, to you by my letter dated March 29, 1979 (L-79-74). A recent review of the document revealed some pages which had been inadvertently omitted in the reproduction process. Enclosed are two (2) copies of pages III.B.1-47 through III.B.1-61 with which to complete the report sent to you earlier.

Yours very truly,

J. A. de Mesty

for

Robert E. Uhrig
Vice President

Enclosures

cc: Director, Office of Inspection and Enforcement (1)
Director, Office of Nuclear Reactor Regulation (17)
Robert Lowenstein, Esq. w/o encl.

A007
S
1/1

7911090 497

R

Table 1. A list of Birds observed in the Study Area for 1978. (CONT'D)

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE	SEASON OF OCCURRENCE
White Pelican	Pelecanus erythrorhynchos	Rare	Winter
Brown Polican	Pelecanus occidentalis carolinensis	Uncommon	Permanent
Double-crested Cormorant	Phalacrocorax auritis	Common	Permanent
Red-brested Merganser	Mergus serrator	Common	Winter
Blue-winged Teal	Anas discors	Uncommon	Winter
American Coot	Fulica americana	Common	Winter
Florida Gallinule	Porphyrula martinica	Common	Permanent
Mottled Duck	Anas fulvigula	Uncommon	Permanent
Pied-billed Grebe	Podilymbus podiceps	Common	Permanent
Herring Gull	Larus argentatus	Fairly Common	Winter
Ring-billed Gull	Larus delaware nsis	Fairly Common	Winter
Laughing Gull	Larus atricilla	Common	Permanent
Least Term	Sterna albifrons	Common	Summer
Belted Kingfisher	Megaceryle alcyon	Common	Permanent

III.8.1-47

791090

502

Table 1. A list of Birds observed in the Study Area for 1978. (CONT'D)

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE	SEASON OF OCCURRENCE
Turkey Vulture	Cathartes aura	Common	Permanent
Black Vulture	Coragyps atratus	Common	Permanent
Gray Kingbird	Tyrannus dominicensis dominicensis	Common	Permanent
Red-winged Blackbird	Agelaius phoeniceus	Common	Permanent
House Sparrow	Passer domesticus	Common	Permanent
Savannah Sparrow	Passerculus sandwichensis	Common	Winter
Tree Swallow	Iridoprocne bicolor	Uncommon	Winter
Barn Swallow	Hirundo rustica	Common	Fall
Common Crow	Crovus brachyrhynchos	Common	Permanent
White-crowned Pigeon	Columba leucocephala	Uncommon	Summer
Rock Dove	Columba livia	Common	Permanent
Mourning Dove	Zenaidura macroura	Common	Permanent
Ground Dove	Columbigullina passerina	Common	Permanent

Table 1. A list of Birds observed in the Study Area for 1978. (CONT'D)

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE	SEASON OF OCCURRENCE
Northern Waterthrush	Seivrus noveboracensis	Rare	Winter
Yellowthroat	Geothlypis trichas	Uncommon	Permanent
Blue-Gray Gnat Catcher	Polioptila caerulea	Uncommon	Winter
Palm Warbler	Dendroica palmarum	Common	Winter
Blackpoll Warbler	Dendroica striata	Uncommon	Spring & Fall
Pine Warbler	Dendroica pinus	Fairly Common	Permanent
House Wren	Troglodytes aedon	Common	Winter
Bobolink	Dolichonyx oryzivorus	Fairly Common	Spring & Fall
Indigo Bunting	Passerina cyanea	Uncommon	Spring & Fall
Mockingbird	Mimus polyglottos	Common	Permanent
Catbird	Dumetella carolinensis	Common	Permanent
Cardinal	Richmondena cardinalis	Common	Permanent
Eastern Meadowlark	Sturnella magna	Common	Permanent

Table 2. A list of Reptiles and Amphibians observed in the Study Area for 1978.

COMMON NAME	SCIENTIFIC NAME	PREFERRED HABITAT
American Crocodile	Crocodylus acutus	Salt or brackish water
Florida Softshell	Trionyx ferox	Lakes, ponds, canals, roadside ditches
Florida Snapping Turtle	Chelydra serpentina osceola	Any permanent body of freshwater
Eastern Idigo Snake	Drymarchon corais couperi	Near thickets of dense natural vegetation
Mangrove Water Snake	Natrix fasciata compressicauda	Salt or brackish water
Black Rat Snake	Elaphe obsoleta obsoleta	Extremely variable
Mud Snake	Farancia abacura	Swamps and lowlands
Reef Gecko	Sphaerodactylus notatus notatus	Around buildings
South Eastern Fivelined Skink	Eumeces inexpectatus	On spoil banks
Brown Anole	Anolis sagrei	
Green Anole	Anolis carolinensis	Scrub and vines
Cuban Tree Frog	Hyla septentrionalis	Hides near moisture
Spadefoot Toad	Scaphiopus holbrooki holbrooki	Sandy soils

III.B.1-50

Table 3. A list of Mammals observed in the Study Area for 1978.

COMMON NAME	SCIENTIFIC NAME	PREFERRED HABITAT
Cat	Felis domestica	Associated with man
Marsh Rabbit	Sylvilagus palustris	Berms, swamps, and hammocks
Raccoon	Procyon lotor	Along streams, berms
Black Rat	Rattus rattus	Buildings & occasionally in fields

Table 4. A comparison of Study Area Bird species 1978, to Surrounding Area species.

	TURKEY POINT	SURROUNDING AREA
American Bittern	X	X
American Coot	X	
American Goldfinch		X
American Kestrel	X	X
American Redstart		X
Anhinga		X
Bald Eagle	X	X
Barn Swallow	X	X
Belted Kingfisher	X	X
Black-bellied Plover	X	X
Black-crowned Night Heron		X
Black-necked Stilt	X	
Black Skimmer	X	X
Black Vulture	X	
Blackpoll Warbler	X	X
Black-whiskered Vireo		X
Blue-gray Gnatcatcher	X	X
Blue Jay		X
Blue-winged Teal	X	
Boat-tailed Grackle		X
Bobolink	X	X
Broadwinged Hawk	X	
Brown Pelican	X	X
Cardinal	X	X
Caspida Tern		X
Catbird	X	
Cattle Egret	X	X
Cedar Waxwing		X
Chuck-Will's Widow		X
Clapper Rail		X
Common Crow	X	
Common Egret	X	X
Common Flicker		X
Common Grackle		X
Common Nighthawk	X	X
Common Snipe		X
Double-Crested Cormorant	X	X
Downy Woodpecker		X
Eastern Meadowlark	X	X
Eastern Phoebe		X
Florida Gallinule	X	
Glossy Ibis		X
Gray Kingbird	X	X
Great Blue Heron	X	X
Great White Heron	X	

Table 4. A comparison of Study Area Bird species (CONT'D) 1978, to Surrounding Area species.

	TURKEY POINT	SURROUNDING AREA
Green Heron	X	X
Ground Dove	X	
Herring Gull	X	X
House Sparrow	X	
House Wren	X	X
Killdeer	X	X
Laughing Gull	X	X
Least Tern	X	X
Little Blue Heron	X	X
Louisana Heron	X	X
Magnificent Frigatebird	X	X
Marsh Hawk	X	
Merlin	X	X
Mockingbird	X	X
Mottled Duck	X	
Mourning Dove	X	
Northern Waterthrush	X	X
Osprey	X	X
Palm Warbler	X	X
Peregrine Falcon		X
Pie-billed Grebe	X	X
Pine Warbler	X	
Prairie Warbler		X
Red-bellied Woodpecker	X	X
Red-brested Merganser	X	X
Reddish Egret	X	X
Red-shouldered Hawk		X
Red-winged Blackbird	X	X
Ring-billed Gull	X	X
Roseate Spoonbill	X	X
Rock Dove	X	
Royal Tern		X
Sanderling		X
Savannah Sparrow	X	
Screech Owl	X	
Semipalmated Plover	X	
Sharp-shinned Hawk		X
Snowy Egret	X	X
Tree Swallow	X	X
Turkey Vulture	X	X
White-crowned Pigeon	X	
White-eyed Vireo		X
White Ibis	X	

Table 4. A comparison of Study Area Bird species 1978, to Surrounding Area species. (CONT'D)

	TURKEY POINT	SURROUNDING AREA
White Pelican	X	X
Willet		X
Wood Duck		X
Wood Ibis	X	
Yellowlegs		X
Yellowthroat	X	X
Yellow-bellied Sapsucker		X
Yellow-crowned Night Heron	X	X
Yellow-rumped Warbler		X
Yellow Warbler		X

Table 5. A comparison of Study Area Reptiles and Amphibians for 1978, to Surrounding Area species.

	TURKEY POINT	SURROUNDING AREA
American Alligator		X
American Crocodile	X	X
Bahaman Bark Anole		X
Black Rat Snake	X	
Brown Anole	X	
Corn Snake		X
Cuban Treefrog	X	X
Eastern Diamondback Rattlesnake		X
Eastern Indigo Snake	X	X
Everglades Racer		X
Florida Cricket Frog		X
Florida Softshell	X	X
Florida Snapping Turtle	X	
Florida Water Snake		X
Green Anole	X	X
Green House Frog		X
Green Treefrog		X
Key West Anole		X
Mangrove Water Snake	X	X
Mud Snake	X	
Cuban Tree Frog	X	
Pig Frog		X
Reef Gecko	X	
South Eastern Five-lined Skink	X	
Southern Leopard Frog		X
Spadefoot Toad	X	

Table 6. A comparison of Study Area Mammals for 1978, to Surrounding Area in species.

	TURKEY POINT	SURROUNDING AREA
Black Rat	X	X
Bob Cat		X
Cotton Rat		X
Dolphin		X
Domestic Cat	X	
House Mouse		X
Manatee		X
Marsh Rabbit	X	X
Raccoon	X	X
Rice Rat		X
White Tailed deer		X

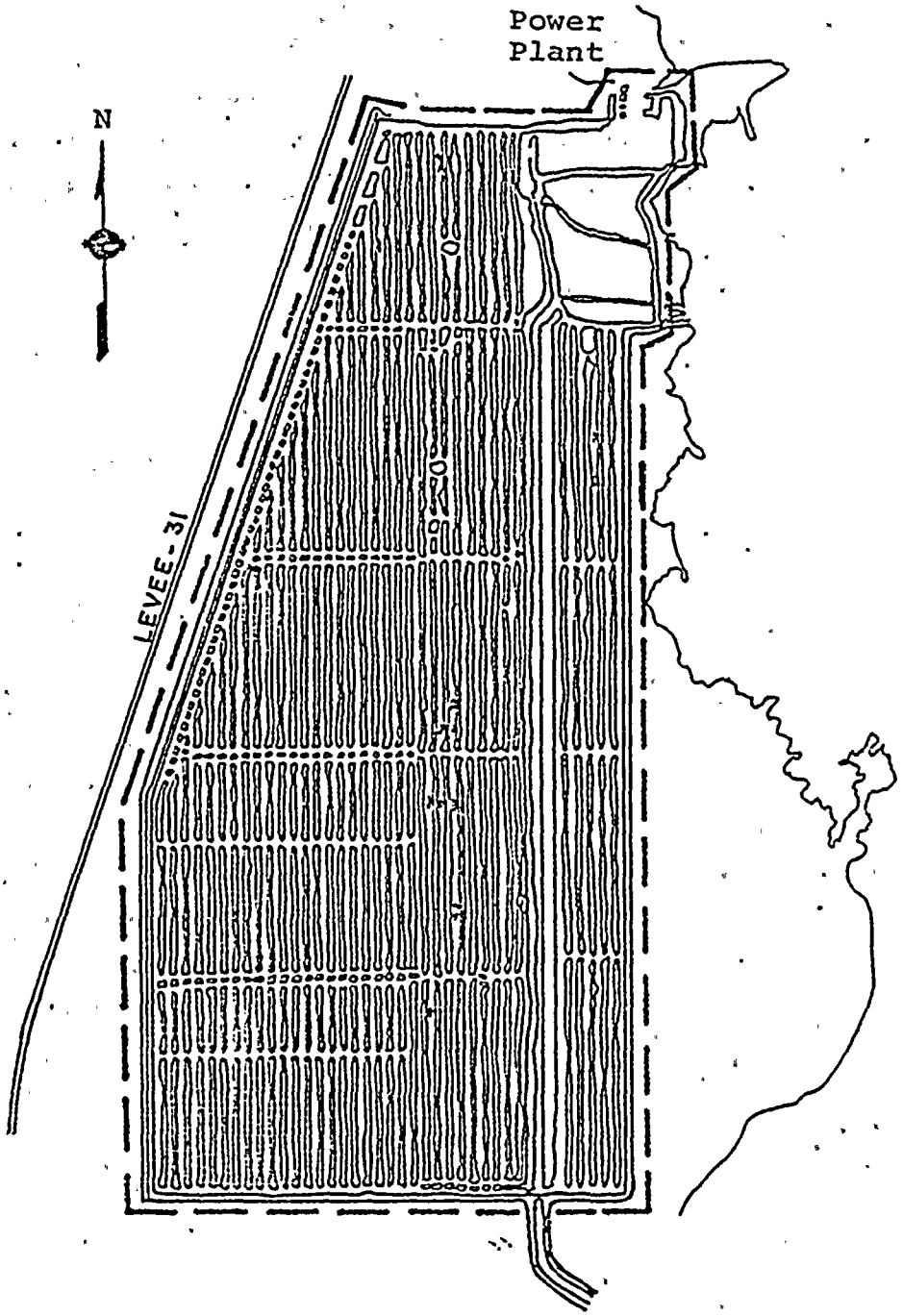


Figure 1. Faunal Study Area at the Turkey Point Cooling Canal System.

REFERENCES

Applied Biology, Inc. 1978. Evaluation of Ecological Studies Conducted at Turkey Point and South Dade Area. Atlanta, Georgia.

Applied Biology, Inc. 1978. Baseline Ecological Study of a Subtropical Terrestrial Biome in Southern Dade County, Florida. Atlanta, Georgia.

Florida Power and Light Company. 1976. Turkey Point Units 3 & 4 Semiannual Environmental Monitoring Report No. 9. Miami, Florida.

Florida Power and Light Company. Unpublished. Environmental Report, South Dade Plant Units 1 & 2. Vol. 1,2. Miami, Florida.

Peterson, R.T. 1947. A Field Guide to the Birds. Houghton Nifflin Company. Boston, Massachuetts.

Robbins, C.S., B. Bruun, and H. S. Zim. 1966. Birds of North America. Western Publishing Company, Inc. Rocaine, Wisconsin.

Induced Revegetation

Method

The 30 species of grasses, shrubs, and trees planted during the 1973-74 Initial Study Project were checked quarterly for survival and vitality (Table 1). The parameter of vitality was an attempt to single out plants which could survive, but were in some manner inhibited in growth.

Discussion and Conclusions

Growth rates and vitality continued to be higher in the more organic areas and lower in the mucky clays. These trends were best observed in the species with excellent survival rates. For example, the Coccoloba uvifera (sea grapes), planted in organic soils, were as tall as 3.5 meters and ocvered areas of $9m^2$ or more. These large plants produced an abundance of seeds, resulting in numerous seedlings. Sea grapes planted in the mucky clays, although seeming healthy, remained small and exhibited little new growth. No plantings of the Initial Study remained in the clay areas. Several of the sites have been overgrown by native plant species, particularly Conocarpus erectus (buttonwoods), with a resulting loss of vigor and increase in mortality to the test species.

Plants in the "Excellent" and "Good" survival categories generally exhibited "Good" vitality, thus indicating a tolerance to wind exposure and saline conditions on the berms. An exception, Cocculus laurifolius, showed only "Fair" survival, but "Excellent" vitality. It survived only in organic soil areas that were protected from extreme sun and wind by native vegetation.

Generally, the patterns of mortality and vigor are unchanged since 1975.

Table 1. Average survival rates and vitality of the Initial Study Plantings quarterly during 1978. See Figure 1 for test site locations.

Vitality		
	EXCELLENT (90% survival)	
Good	Coccoloba uvifera	Sea Grape
Good	Conocarpus erectus	Silver Button Bush
Good	Scaevola frutescens	Scaeval Shrub
Exc.	Zoysia japonica	Zoysia Grass
	GOOD (60-89% survival)	
Fair	Pittosporum tobira	Green Pittosporum
Good	Rhoeo discolor	Oyster Plant
Good	Zamia intergrifolia	Cootie Evergreen
	FAIR (30-59% survival)	
Fair	Cocos nucifera	Coconut Plam
Good	Pittosporum sp.	Variegated Pittosporum
Good	Crinum asiaticum	Crinum Lily
Fair	Stenotaphrum secundatum	Bitter Blue Grass
Exc.	Cocculus laurifolius	Snail Seed
	POOR (30% survival)	
Fair	Eugenia uniflora	Florida Cherry
Poor	Cortaderia selloana	Pampas Grass
Poor	Hymenocallis palmeri	Spider Lily

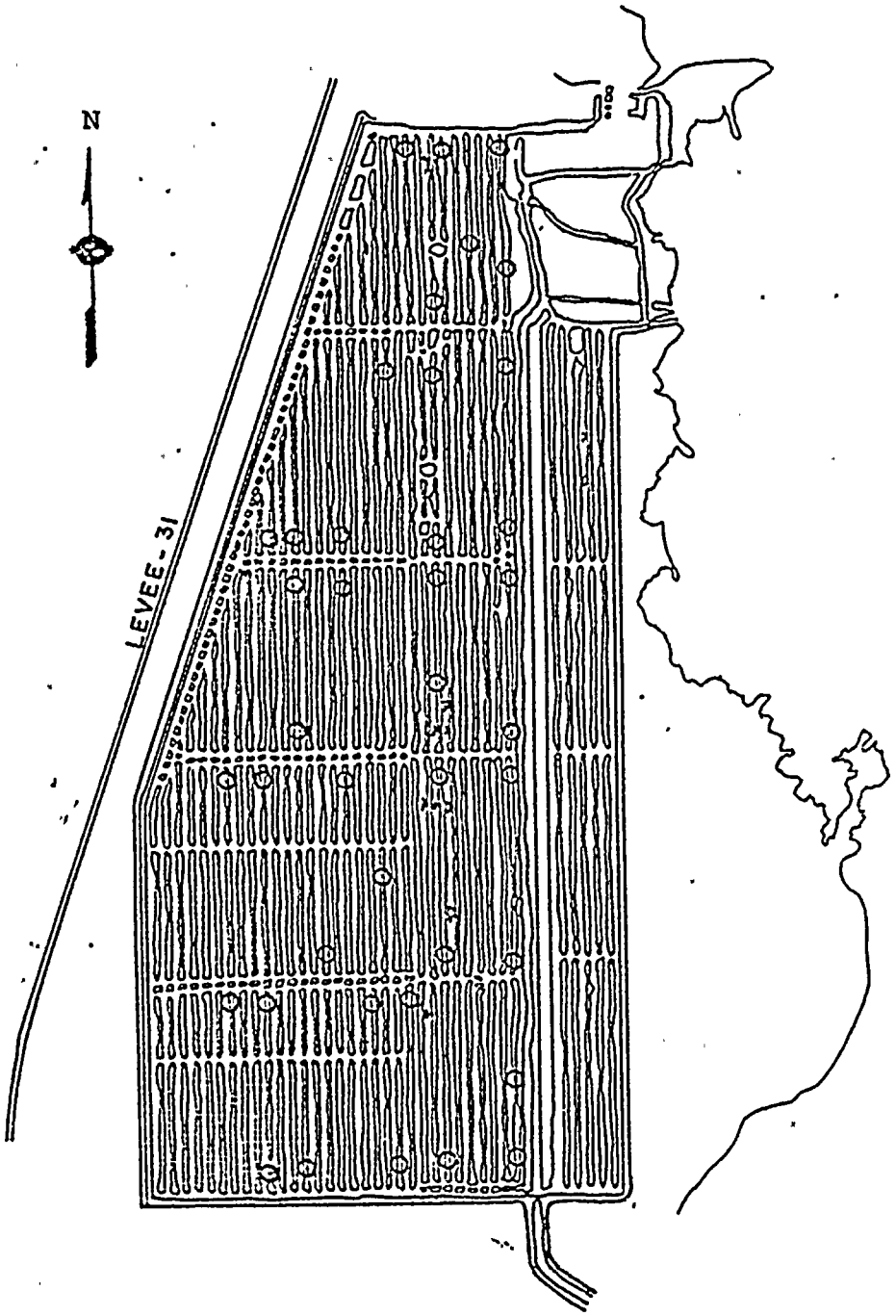


Figure 1. Induced Revegetation test sites at the Turkey Point Cooling Canal System.

2. SAMPLING SOUTH AND WEST OF COOLING CANAL SYSTEM (ETS 4.2.2.3)

Soil Study (ETS 4.2.2.3)

Introduction

The purpose of the soil study was to conduct limited sampling of soil nutrients to the south and west of the Turkey Point canal system.

Materials and methods

Soil samples were taken from the midpoint of Transects 1, 3, 5, 7, and 9 (Soil Study Figure 1). A small coring of several grams was taken after removal of the first inch of soil. A second sample was taken 12 inches below the first. All samples were preserved on ice and sent to the laboratory. An acidified sodium chloride extraction procedure was used for nitrite and nitrate procedures (Jackson, 1958). Nitrate was reduced to nitrite by a cadmium column and the nitrite was analyzed using the diazotization method (APHA, 1976).

Nitrite and nitrate values were reported as nitrogen in mg/g of dry weight of sample (Soil Study Table 1). All values were less than 0.2 mg/g which is the limit of detection for this method.

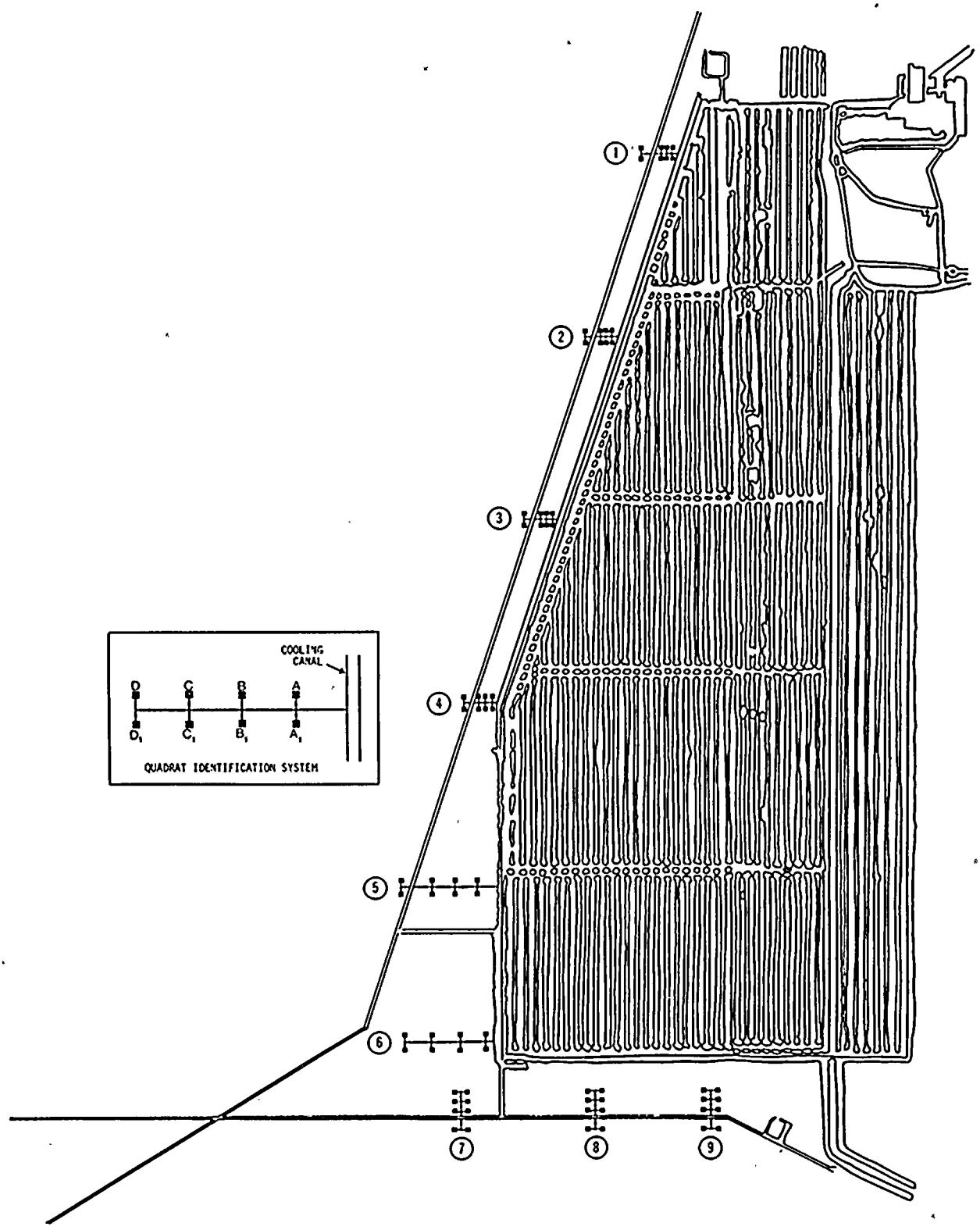
Summary and conclusions

There was no increase in nitrite and nitrate values in sediments when compared with analyses performed in earlier years.

LITERATURE CITED

APHA. 1976. Standard methods for the examination of water and wastewater, 14th ed. American Public Health Association, Washington, D.C. 1193 pp.

Jackson, M.L. 1958. Soil chemical analysis. Prentice-Hall, Incorporated, Englewood Cliffs, N.J. pp. 193-194.



Soil Study Figure 1. Vegetation transects, Turkey Point Plant, 1978 (soil samples were collected from transects 1, 3, 5, 7, and 9).

SOIL STUDY TABLE 1

LABORATORY ANALYSIS OF TEN SOIL SAMPLES
TURKEY POINT PLANT
DECEMBER 1978

Transect Number	Soil Depth (in)	Nitrite N (mg/g)	Nitrate N (mg/g)
1	1	<0.2	<0.2
	12	<0.2	<0.2
3	1	<0.2	<0.2
	12	<0.2	<0.2
5	1	<0.2	<0.2
	12	<0.2	<0.2
7	1	<0.2	<0.2
	12	<0.2	<0.2
9	1	<0.2	<0.2
	12	<0.2	<0.2

Vegetation Study (ETS 4.2.2.3)

Introduction

The purpose of this study was to determine if the vegetation to the west and to the south of the Turkey Point Plant cooling canal system has changed as a result of the system's operation.

Communities present - The vegetation was sampled initially in 1972, using traditional botanical survey methods, to provide a baseline characterization of the local communities (FPL, 1972). This data has been used for qualitative comparisons with subsequent data. Based on the 1972 baseline survey and on interpretation of aerial photographs, the vegetation has been classified into three community-types.

The community-type to the south of the cooling canal system is a mangrove community which occupies the transition zone between the freshwater communities to the west of the study area and the salt-water communities to the east. The dominant community-type to the west of the cooling canal system is a grassland characterized by sawgrass, salt rush and salt grass; this is interrupted by the third community-type, which consists of tree islands characterized by mangrove species and buttonwoods. Each of these community-types has been sampled for this study.

Study design - In 1975, the study was redesigned to discriminate between vegetational changes attributable to the cooling canal system and those not caused by the system; that is, caused by natural factors such as frost or succession or caused by the L-31 levee and borrow canal. The key to detecting the operational impact of the cooling canal system is the assumption that this impact is the only effect which should decrease with distance from the system. The locations for the sample quadrats were chosen according to the principles of statistical experimental design. Thus, the effects of the cooling canal system can be tested for significance by analysis of frequencies for the community composition data and by analysis of variance for the biomass data. This statistical study design has been used for each study since 1975, so the data sets are directly comparable between years.

Since 1976, the data have come from permanent transects. This has reduced the sampling error and, from a practical point of view, has increased the ability to detect even small changes in vegetation.

Parameters monitored - The vegetational communities could respond to the effects of the cooling canal system by changes in composition, that is, the species present; or by changes in structure, that is, the amount of biomass available to capture solar energy and transfer the energy up the food chain.

For the present study, community composition has been estimated by relative frequency, which is defined as the number of quadrats in which the species occurred divided by the total number of quadrats. Thus, the resulting values estimate the probabilities of encountering at least one individual of the species in one quadrat.

Biomass has been estimated by a volume-density index developed for this study. This index estimates the volume (height x radius^2) and weights it by the density of individuals within the volume. This method is analogous to traditional measures of yield (Greig-Smith, 1964) and shares the advantage of the traditional measures in that it can be determined easily in the field. The volume-density index has the further advantage of making possible comparisons of species with different growth forms.

Materials and Methods

Transect lines - Nine transect lines were established; six transects ran east-west, adjacent to the western border of the canal system, and three transects ran north-south, adjacent to the southern border of the canal system (Vegetation Figure 1). The transect lines were then divided into quadrats. Eight quadrats, 5x5 m (25 m^2) were delineated, so that four quadrats lay north or west of the transect and four lay south or east. Thus, 72 quadrats were laid out encompassing a sample area of 1800 m^2.

The six transects west of the canal system were chosen so that three transects sampled tree islands and three sampled grasslands. The transect lines were specifically selected so that the first and last quadrats were in either woody or graminoid areas. The remaining quadrat locations were a fixed distance from the predetermined quadrats and were thus random in relation to the habitats between two points.

Control quadrats - The South Florida Water Management District L-31 levee and borrow canal lies just west of the Turkey Point canal system. Because much of the sampled vegetation lay between this active drainage canal and the Turkey Point canal system, suitable control quadrats had to be located outside the influence of both systems. To prevent potential impacts of the L-31 levee and borrow canal from confounding the study results, control quadrats for east-west transects 1 through 5 were located west of the canal. Control quadrats for Transect 6 were located east of the canal because the distance between the cooling canal system and the L-31 canal was too great to place them to the west.

Data analysis - In order to make meaningful comparisons between woody and graminoid habitats, the volume-density index previously cited was employed to quantify the height, diameter, and density of all species sampled. This index was used as an estimate of

biomass. Sample index calculations derived for this study can be seen in Vegetation Figure 2. A volume-density index value was calculated for each dominant plant species in each quadrat. Quadrats located opposite each other along the transects were averaged into four quadrat means and used in analysis of variance.

Relative frequencies for all observed species were calculated by pooling the data from 1975 through 1978. Relative frequency is defined as the number of quadrats in which the species occurred divided by the total number of quadrats in the study. The resulting values estimate the probabilities of encountering at least one individual of the species in one quadrat. As a set of probabilities, frequency data can be useful in the analysis of community organization.

The statistical design was a randomized factorial analysis. To estimate sampling error, the pairs of quadrats (A-A_1, B-B_1, ...) were considered to be replicates. The impact of the cooling canal system was estimated with quadrats as one factor in the analysis. The effects of natural causes were estimated with transects as a second factor in the analysis. The combined effect of the cooling canal system and natural causes was estimated from the interaction of the two factors; for example, the canal system could ameliorate the effects of frost, or retard succession. The impacts of the L-31 levee and borrow canal on the grassland

and tree island communities were also estimated from the interaction. This was possible because the distance between the L-31 borrow canal and the cooling canal system is not uniform, and because it was assumed that the operational impact of the canals would decrease with distance from both canal systems.

Results and Discussion

Plant Species at Turkey Point - Sixty-four (64) plant species were recorded at Turkey Point in 1978. Of these, 22 had not been reported in previous studies. In all, 125 species have been recorded from the study quadrats since 1975 (Vegetation Table 1). Normally, the number of new species observed each year will steadily decrease as the number of species observed approaches the total number of species present, but no evidence of this trend was apparent in the Turkey Point data (Vegetation Figure 3). Since the data shows that new species are still being encountered at Turkey Point each year, it is probable that a species change is occurring.

The analysis of the species list for the Turkey Point study area has provided evidence that a change in species composition is occurring, but has provided no information on the cause of the change.

Community composition - The relative frequency data have been examined to determine if there were any changes in the relative frequencies of the species. A G-test on the 16 species which have been present each year, with a null hypothesis that the species frequencies are independent of time, yields: G=98.34, which is highly significant (α=.001; Pearson and Hartley, 1966). Therefore, the composition of the Turkey Point vegetation has changed significantly during these studies. To determine the nature of this change in composition, those species which have changed substantially in relative frequency have been reviewed (Vegetation Table 2). The relative frequencies of the species in the 1972 baseline survey were then used to assess the ecological significance of the observed changes.

The species which decreased between 1976 and 1977 had higher frequencies in the woody communities than in the grasslands during the 1972 baseline survey (FPL, 1972). The 1976-1977 change thus involved a shift from woody communities toward grassland communities. However, most of these species then increased between 1977 and 1978, suggesting that the vegetation has partially recovered from the 1976-1977 disturbance. Since there was a killing freeze in January 1977 (ABI, 1978), an event with a return period of about once in 10 years (Bradley, 1975), and since all of these species have tropical origins, it was concluded that these changes in composition were caused by the freeze.

There was no clear trend among the species whose frequencies increased between 1976 and 1977. The species involved appear to have been selected randomly from all community-types. Only one-third of these species then decreased between 1977 and 1978. These changes in species composition probably were secondary effects due to the changes described above.

Biomass, 1978 study - Vegetation volume-density indices by transect are presented in Vegetation Tables 3 through 11. The analysis of variance for all of the data (Vegetation Table 12) showed a significant difference (α=.05; Pearson and Hartley, 1966) between transects. It was assumed that this difference resulted from combining data from three different community-types, so the data were segregated by community-type for subsequent analysis, and each transect was assigned to a community-type as follows:

Transect No.	Community-type
1, 3, 5	grassland
2, 4, 6	tree island
7, 8, 9	mangrove

The analysis of variance by community-types (Vegetation Tables 13 through 15) indicated that each community was essentially homogeneous (α=.05; Pearson and Hartley, 1966) in terms of biomass.

Biomass, long-term analysis - This 1978 study was the first of the Turkey Point studies to show that the biomass within each community is homogeneous (α=.05). In each previous study, 1975 through 1977, significant differences in biomass were reported within community-types (Vegetation Tables 16 through 18). This raises the question of what happened to those differences previously detected. To answer this question, the results of the previous studies were reviewed by community-type to determine the ecological significance of the statistical differences detected.

The analysis of variance for the mangrove community (Vegetation Table 15) in 1975 and 1976 detected differences between quadrats, transects, and the interaction effect described previously. An ecological explanation of these results is that there was a small scale pattern in the distribution of biomass, so the mangrove community was a mosaic consisting of high biomass patches dominated by mangrove species and low biomass patches dominated by graminoid species. This interpretation is consistent with the 1972 baseline survey, which reported domes of tree islands (high biomass patches) in the mangrove community (FPL, 1972). In 1977 there was no longer a significant difference between quadrats. Since there was a killing freeze during the winter of 1976-1977 (ABI, 1978), the decrease in significant differences means that the effects of the freeze may have been greater in the domed tree islands than in the low biomass

grassy areas between domes, thus reducing the difference between the patches. Woody plants are typically more sensitive to freeze damage than graminoid species (Dansereau, 1957), because the leaf buds of trees and shrubs are exposed to the air while graminoid leaf buds are insulated from the cold by the persistent grass blades. The analysis of the 1978 data detected no significant differences, so the successional recovery from the freeze damage probably was greater in the low biomass areas where the damage was less severe. Succession is generally believed to proceed more rapidly in non-woody, low biomass vegetation than in woody, high biomass vegetation (Odum, 1969). This further obscured the differences between the domes and the intervening spaces. Therefore, the observed changes in the mangrove community biomass probably were caused by response to the freeze and to differential recovery from the freeze by the vegetation.

The only significant difference reported for the tree island community (Vegetation Table 14) in 1975 was the interaction effect. Noting that tree islands are patches in the grassland suggests that the patches detected in this community-type represented island centers (high biomass) and edges (low biomass). In 1976 no significant differences were detected. Apparently, succession increased the biomass of the island edges sufficiently to obscure the difference between the center and the edge. The lack of significant differences

in 1977 implies that the effect of the killing freeze was uniform in the tree islands. Therefore, the observed changes in the tree island community biomass probably were attributable to natural succession.

The grassland community (Vegetation Table 13) had a small scale pattern in 1975, since significant differences in biomass were reported between quadrats, transects, and the interaction effect. This suggests that the high biomass shrub islands (dominated by buttonwood) were separated by low biomass areas (dominated by grasses). In 1976 the only significant difference was between transects. Apparently, succession obscured the differences in biomass within the transects. In 1977 there were no significant differences. The killing freeze had a greater effect on the shrub islands than on the grassy area between shrub islands, again due to differences in susceptibilities of woody and graminoid species. Since no significant differences were reported in 1978, successional recovery from the effects of the frost was therefore independent of the intensity of the frost damage.

Summary and Conclusions

Each year's data set has contributed a sizable number of species to the floristic species list for the Turkey Point study areas, bringing the total to 125 species. The relatively high number of

new species encountered each year suggests that the flora is changing, but of itself does not explain why. The other analyses performed indicated that succession is occurring, which would explain the change in flora.

There have been highly significant (α=.001) changes in the relative frequencies of the plant species at the Turkey Point site during the last four years. These changes occurred between 1976 and 1977, and between 1977 and 1978. The species which decreased between 1976 and 1977 were tropical species of the tree island community, but these same species increased between 1977 and 1978. These changes were attributed to the 10-year return period freeze in the winter of 1976-1977 and to the recovery of the vegetation from the damage. These changes in the vegetation further induced other changes, with several species from various community-types increasing between 1976 and 1977, and other species also from various community-types decreasing between 1977 and 1978.

The only significant difference in the vegetation volume-density index, which estimates biomass, was between community-types. Since other significant differences were detected in previous studies, the absence of the significant differences in 1978 must be taken as a change in the vegetation. Each community-type was analyzed separately, but the ecological changes indicated by the statistical

analyses were similar between the community-types. Initially, the vegetation was a mosaic of patches of different biomass. Over time, the patches became more similar to each other, until the biomass throughout each community-type was homogeneous. This change resulted from natural succession, and from the differential effects of the 10-year return period freeze of 1976-1977 on both the woody and graminoid species.

Thus, each parameter of the vegetation which was examined at the Turkey Point Plant site between 1975 and 1978 has changed during the course of these studies. In every case, it has been shown that these changes could be attributed to natural causes, that is, succession and a 10-year return period freeze. No evidence has been found to indicate that the operation of the Turkey Point Plant cooling canal system has induced changes in the vegetation to the west or to the south of the system.

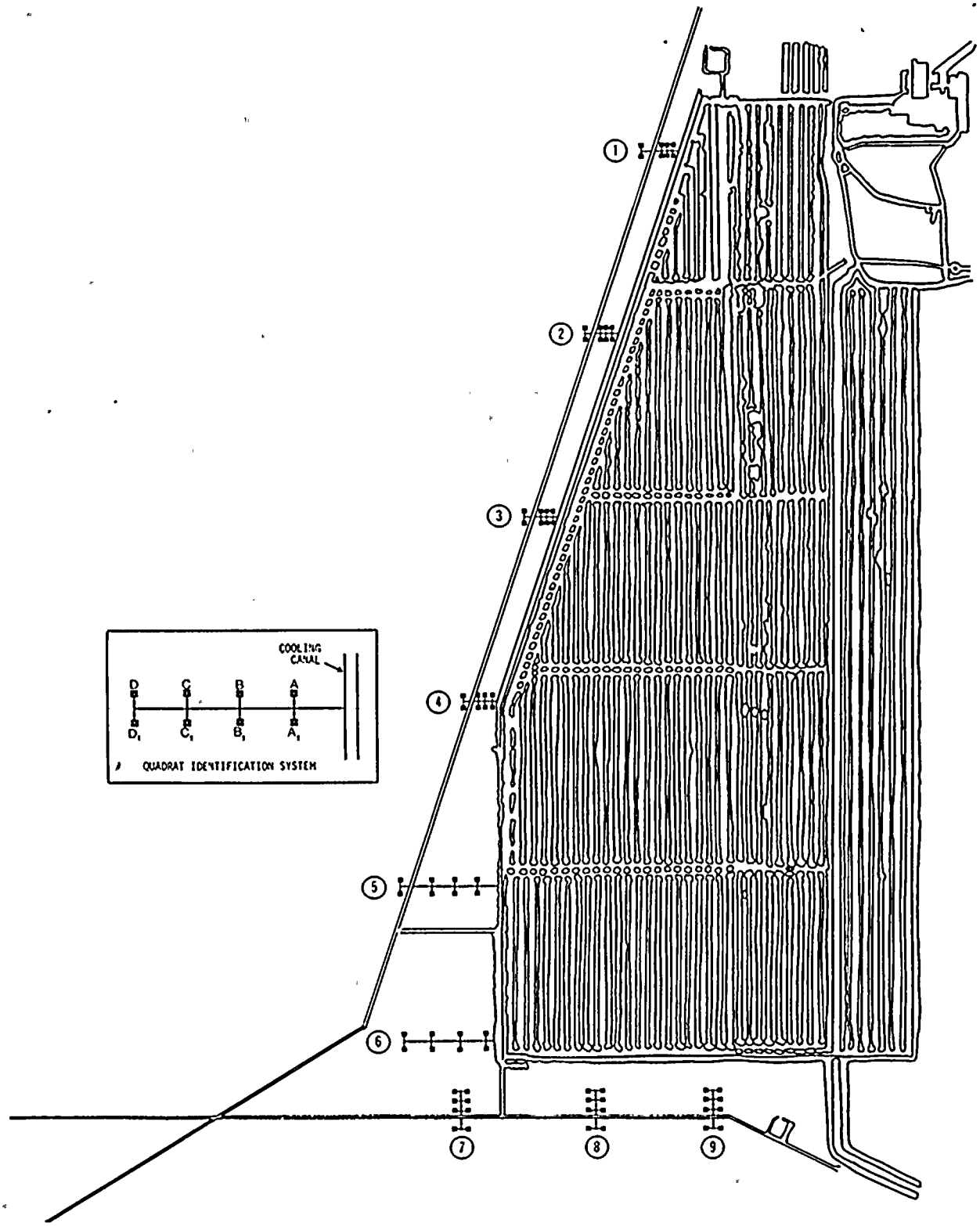
LITERATURE CITED

Bradley, J.T. 1975. Freeze probabilities in Florida. Agricultural Experiment Stations, Institute of Food and Agricultural Sciences, Bull. 777 (technical). 22 p.

Dansereau, P. 1957. Biogeography: an ecological perspective. Ronald Press, New York, N.Y. 394 pp.

FPL. 1972. Study of the flora present in a new area, Turkey Point Plant site. Prepared for Florida Power & Light Co. by Albert A. Will, Jr.

Pearson, E.S., and H.O. Hartley, eds. 1966. Biometrika tables for statisticians, Vol. I. Cambridge Univ. Press, Cambridge, Mass. 264 pp.



Vegetation Figure 1. Location of vegetation sampling transects. Turkey Point Plant, 1978.

Example 1. Saw grass (*Cladium* sp.)

$$\textit{Cladium}\ \text{index} = \frac{N \cdot H \cdot R^2}{A}$$

where:

A = Area of sample in meters

N = Number of graminoid samples

H = Height of grass blades in cm

R = Radius of clumps in cm (gathered, compressed, and measured at widest point).

sample values

A = 1.0

N = 240

H = 142.2

R = 1.59

Cladium Index $= \frac{(240)(142.2)(2.52)}{1.0} = 86{,}002.56$

Example 2. Woody shrub (*Conocarpus*)

$$\textit{Conocarpus}\ \text{index} = N \cdot H \cdot R^2$$

where:

N = Number of shrubs of same dimensions

H = Shrub height in cm

R = Maximum radius of trunk

sample values

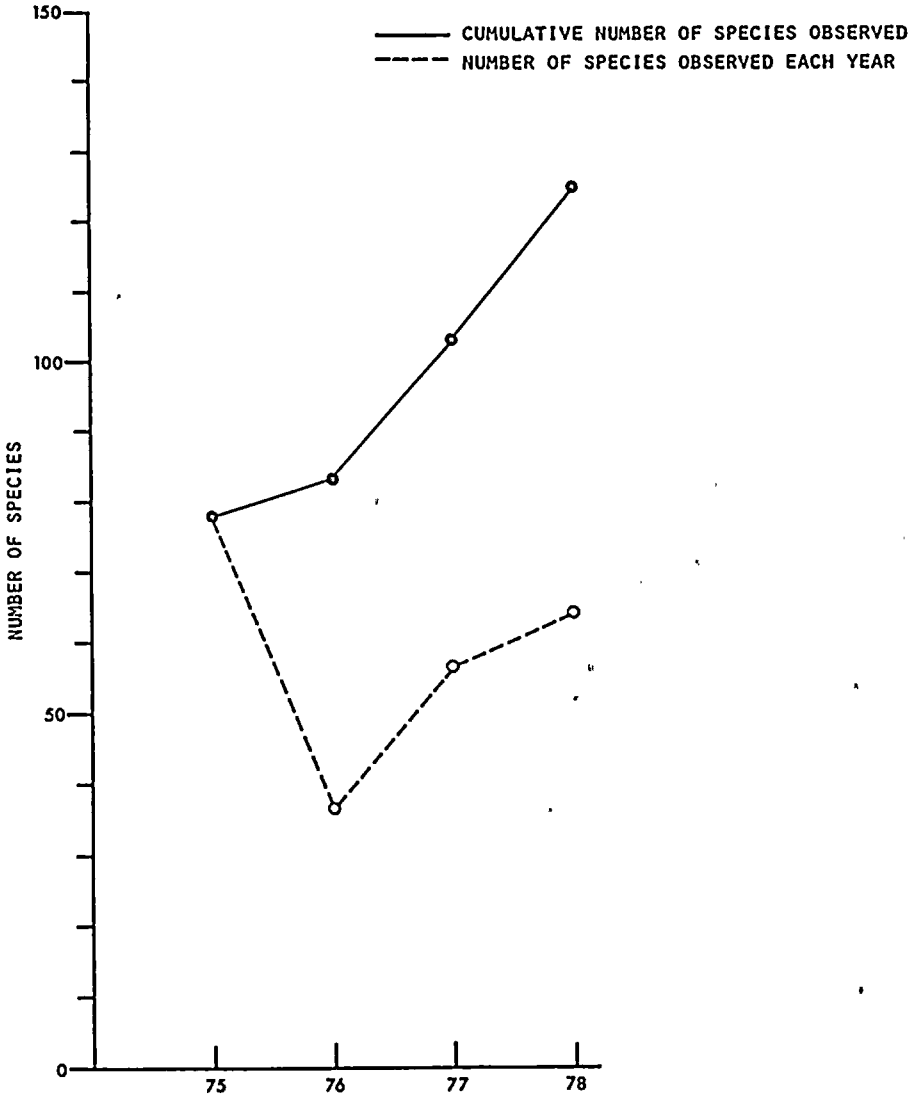
N = 1.0

H = 365.8

$R = 6.45^2$

Conocarpus Index $= (1.0)(365.8)(6.45^{\ }) = 15{,}218.19$

Vegetation Figure 2. Examples of volume-density index calculations of a graminoid and woody plant species.



Vegetation Figure 3. Number of plant species observed at Turkey Point, 1975-1978.

VEGETATION TABLE 1

PLANT SPECIES FOUND IN SAMPLING QUADRATS
TURKEY POINT
1975-1978

Scientific Name	Common Name	Present in 1978	Frequency (%)[a]
Acrostichum aureum	leather fern	X	17.0
Annona glabra	pond apple		0.3
Ardisia escallonioides	marlberry		1.0[b]
Aster sp.	aster	X	15.3[c]
A. tenuifolius v. *aphyllis*	aster		-
Aviconnia germinans	black mangrove		1.0[b]
Baccharis sp.	groundsel	X	6.9
Baccharis angustifolia	false willow	X	1.4
B. glomeruliflora	groundsel tree	X	-
B. halimifolia v. *angustior*	salt bush	X	0.7
Bacopa monnieri	matted figwort		-
Batis maritima	saltwort		-
Blechnum serrulatum	swamp fern	X	13.5
Borrichia arborescens	sea oxeye	X	0.3
B. frutescens	sea daisy	X	7.6
Bucida spinosa	spiny bucida		-
Cakile fusiformis	sea rocket		0.3
Calyptranthes pallens v. *pallens*	pale lidflower		-
Casuarina equisetifolia	Australian pine	X	11.8
Cassytha filiformis	dodder		-
Celtis laevigata	hawkberry		0.3
Cephalanthus occidentalis	buttonbush		0.7
Chamaesyce sp.	spurge	X	0.3
Chara sp.	chara		-
Chiococca alba	snowberry		2.4
Chrysobalanus icaco	coco plum	X	3.8
Cladium jamaicensis	sawgrass	X	83.0
Coccothrinax argentata	silver palmetto		-
Conocarpus erecta	buttonwood	X	75.7
Crinum americanum	string lily		0.3
Cuscuta sp.	dodder	X	0.3
Cyperaceae	sedge family	X	0.7
Dalbergia ecastophyllum	(no common name)		0.3
Dichromena floridensis	(no common name)	X	0.3
Dipholis salicifolia	willow bustic	X	1.7
Distichilis spicata	saltgrass	X	11.5
Eleocharis cellulosa	spikerush	X	7.3
Encyclia tampensis	butterfly orchid		-
Eugenia axillaris	white stopper		1.0
E. myrtoides (E. buxifolia)	Spanish stopper	X	0.3
E. confusa	ironwood	X	0.7
Eulophia alta	wild coco		-
Eupatorium capillifolium	dog fennel	X	1.7
Ficus aurea	strangler fig		0.7
F. citrifolia	wild banyan tree		0.3
Fimbristylis sp.	sedge		0.7
Forestiera segregata	Florida privet		0.7
Fuirena scirpoidea	umbrella grass		0.3
Galium hispidulum	bedstraw		-
Hypericum sp.	St. John's wort	X	3.5
Ilex cassine	dahoon	X	3.5
Ipomoea sagittata	glades morning glory	X	8.7
Jacquemontia curtissii	(no common name)		0.7
J. reclinata	(no common name)	X	1.0
Juncus roemerianus	salt rush	X	17.4
Laguncularia racemosa	white mangrove	X	32.3
Lantana involucrata	bush lantana	X	1.7
Ludwigia microcarpa	small fruited water purslane		-
L. repens	(no common name)	X	1.4
Lycium carolinianum	Christmas berry		1.4
Magnolia virginiana	sweet bay	X	1.7

VEGETATION. TABLE 1
(continued)
PLANT SPECIES FOUND IN SAMPLING QUADRATS
TURKEY POINT
1975 - 1978

Scientific Name	Common Name	Present in 1978	Frequency (%)[a]
Metopium toxiferum	poisonwood	X	5.9
Mikania batatifolia	hempvine	X	-
M. scandens	climbing hempweed	X	1.7
Myrica cerifera	wax myrtle	X	7.3
Myrsine guianensis	myrsine		3.8
Nectandra coriacea	lancewood		-
Nephrolepis biserrata	Boston fern		0.7
Osmunda regalis V. *spectabilis*	royal fern		-
Panicum sp.	panic grass		-
Parthenocissus quinquefolia	Virginia creeper		-
Passiflora suberosa	corky-stemmed passion flower	X	0.7
Persea borbonia	red bay	X	4.2
Phlebodium sp.	golden polypody	X	0.3
P. aureum	golden polypody		-
Pinguicula pumila	butterwort	X	0.7[b]
Pisonia sp.	cockspur		1.4
P. aculeata	devil's claw		1.4
Psilotum nudum	whisk gum		-
Pluchea purpurascens	camphorweed		0.3
P. rosea	marsh fleabane	X	-
Polygala cruciata	milkwort		0.3
P. grandiflora	(no common name)		-
Pontederia lanceolata	pickerelweed		0.3
Proserpinaca sp.	mermaid weed	X	1.4
Pteris vittata	brake fern		-
Randia aculeata	white indigo berry	X	1.4
Rapanea guianensis	(no common name)	X	2.1
Rhexia mariana	meadow beauty	X	0.3
Rhynchospora sp.	beak rush		-
Rhizophora mangle	red mangrove	X	36.8
Rhus sp.	sumac	X	0.3
Sabal palmetto	cabbage palm	X	13.5
Sabatia grandiflora	marsh pink		0.3
Salicornia virginica	perennial glasswort	X	1.7
Salix caroliniana	coastal plain willow		0.3
S. longipes	coastal plain willow	X	0.3
Samolus ebracteatus	water pimpernel		0.3
Sarcostemma clausa	white tuber vine		-
Schinus terebinthifolius	Brazilian pepper tree	X	3.5
Schoenus nigricans	(no common name)	X	3.5
Serenoa repens	saw palmetto		0.3
Sesuvium maritimum	sea purslane		2.4
Smilax auriculata	earleaf briar		-
Solanum blodgettii	nightshade	X	18.7
Solidago microcephala	goldenrod	X	0.3
S. tortifolia	goldenrod		0.3
Sophora tomentosa	necklace rod		-
Swietenia mahagoni	mahogany	X	2.1
Talinum sp.	flame flower		0.3[b]
Thelypteris sp.	(no common name)	X	0.7
T. augescens	(no common name)		-
Tillandsia circinata	air plant	X	1.7
T. fasciculata	air plant		-
T. flexuosa	twisted air plant	X	2.4
T. valenzuelana	soft leaf air plant		-
Torrubia longifolia	beef tree	X	1.0
Toxicodendron radicans	poison ivy	X	0.7
Trema micrantha	Florida trema	X	0.3

VEGETATION TABLE 1
(continued)
PLANT SPECIES FOUND IN SAMPLING QUADRATS
TURKEY POINT
1975-1978

Scientific Name	Common Name	Present in 1978	Frequency (%)[a]
Trema lamarckiana	West Indian trema		0.3
Typha sp.	cattail	X	1.7
Vitis rotundifolia	muscadine grape	X	1.0
Vittaria lineata	shoestring fern	X	0.3
Xyris sp.	yellow-eyed grass	X	1.0
Xyris brevifolia	yellow-eyed grass	X	-

[a]Based on pooled data, 1975-1978.

[b]Including identified species as well as unidentified ones.

[c]Present, can be taken to be less than 0.3% frequency.

VEGETATION TABLE 2

CHANGES IN COMMUNITY COMPOSITION
TURKEY POINT PLANT
1975 - 1978

Species	Observed change in frequency			Frequency class in 1974 baseline survey			
				Grass		Woody	Mangrove
	1975-76	1976-77	1977-78	Dry	Wet		
Rhizophora mangle	0	-	0	-	low	high	high
Acrostichum aureum	0	-	+	-	-	high	-
Blechnum serrulatum	0	-	+	-	-	high	-
Chrysobalanus icaco	0	-	+	-	-	low	-
Conocarpus erecta	0	-	+	low	med	high	med
Casuarina equisetifolia	0	-	+	-	-	med	-
Sabal palmetto	0	-	0	-	low	low	low
Schinus terebinthifolius	0	+	0	high	-	low	-
Baccharis spp.	0	+	-	med	-	med	-
Laguncularia racemosa	0	+	-	low	med	high	med
Eleocharis cellulosa	0	+	0	-	-	low	-
Borrichia fructescens	0	+	0	-	med	low	low
Distichlis spicata	0	+	0	low	high	med	high
Cladium jamaicensis	0	0	+	high	-	med	-
Ipomoea sagittata	0	0	+	med	low	-	-
Mikania batatifolia	0	0	+	low	-	med	-
Persea borbonia	0	0	-	-	-	med	-
Aster sp.	0	+	0	(not reported in 1974)			
Myrsine guianensis	0	0	-	(not reported in 1974)			

VEGETATION TABLE 3

DENSITY-VOLUME INDEX OF VEGETATIONAL QUADRATS ADJACENT TO THE TURKEY POINT CANAL SYSTEM
TRANSECT 1
1978

	Quadrat								
Species	1A1	1A2	1B1	1B2	1C1	1C2	1D1	1D2	Totals
Aster sp.			2			present	8		10
Cladium jamaicensis		222	234		153	662	398	444	2,113
Conocarpus erecta		831	3,948	319	244	19,791	421	340	25,894
Distichlis spicata	1			58					59
Eleocharis cellulosa	801	54	48	193	161		20	14	1,291
Ipomoea saggittata			1						1
Juncus roemerianus	216	129	42	14	142				543
Typha sp.					2,870	27			2,897
TOTALS	1,018	1,236	4,275	584	3,570	20,480	847	798	32,808

VEGETATION TABLE 4

DENSITY-VOLUME INDEX OF VEGETATIONAL QUADRATS ADJACENT TO THE TURKEY POINT CANAL SYSTEM
TRANSECT 2
1978

	Quadrat								
Species	2A1	2A2	2B1	2B2	2C1	2C2	2D1	2D2	Totals
Acrostichum aureum					present	3			.3
Baccharis glomerulifolia						present			
Cladium jamaicensis	1,747	13,348	2,239	5,591	13,859	10,664	2,660	7,042	57,150
Corocarpus erecta	3,081	291,169	1,067	2,412	2,442	352	2,027	178	302,728
Ipomoea saggittata		present							
Juncus roemerianus							77		77
Laguncularia racemosa	839	6	117	1	5,264	1	216		6,444
Mikania scandens	present								
Rhizophora mangle	1,165	391	110	5,353		1	147	607	7,774
Solanum blodgettii						5			5
Tillandsia circinata		present		present				present	
Tillandsia flexuosa		present		present				present	
TOTALS	6,832	304,914	3,533	13,357	21,565	11,026	5,127	7,827	374,181

VEGETATION TABLE 5

DENSITY-VOLUME INDEX OF VEGETATIONAL QUADRATS ADJACENT TO THE TURKEY POINT CANAL SYSTEM
TRANSECT 3
1978

	Quadrat								
Species	3A1	3A2	3B1	3B2	3C1	3C2	3D1	3D2	Totals
Aster sp.			9	1		2			12
Cladium jamaicensis	804	2,086	213	1,953	640	4,643	917	747	12,003
Conocarpus erecta			3,310	1,437		137			4,884
Ipomoea saggittata			13	present					13
Juncus roemerianus					137	108			245
TOTALS	804	2,086	3,545	3,391	777	4,890	917	747	17,157

VEGETATION TABLE 6

DENSITY-VOLUME INDEX OF VEGETATIONAL QUADRATS ADJACENT TO THE TURKEY POINT CANAL SYSTEM
TRANSECT 4
1978

Species	Quadrat								
	4A1	4A2	4B1	4B2	4C1	4C2	4D1	4D2	Totals
Acrostichum aureum			present	7		present			7
Aster sp.	present	present	present					1	1
Baccharis angustifolia					137		102	2	241
Baccharis glomerulifloria						661			661
Baccharis halimifolia					present	present			
Blechnum serrulatum					18	14	2		34
Casuarina equistifolia				present					
Cladium jamaicensis	567	1,584	2,946	12,994	4,604	14,275	14,922	1,355	53,247
Conocarpus erecta	49	7	79	2,653	20	531	1,460	2	4,801
Eupatorium capillifolium	present	present	present			1			1
Hypericum sp.						1	present		1
Ipomoea saggittata	present			present	present		present	present	
Laguncularia racemosa					41,497	2			41,499
Ludwigia repens			present		3	present	2		5
Mikania scandens				present	1	present			1

VEGETATION TABLE 6
(continued)
DENSITY-VOLUME INDEX OF VEGETATIONAL QUADRATS ADJACENT TO THE
TURKEY POINT CANAL SYSTEM
TRANSECT 4
1978

	Quadrat								
Species	4A1	4A2	4B1	4B2	4C1	4C2	4D1	4D2	Totals
Proserpinaca sp.					1	present	1		2
Rhexia mariana			1						1
Rhizophora mangle		78	present						78
Rhus radicans			present	present					
Sabal palmetto				10,140	2,662		115,706		128,508
Salix longipes					42				42
Schinus terebithifolius					11				11
Solanum blodgettii		76	present		59	194	216		545
Thelypteris sp.		present	present						
Xyris sp.			present						
TOTALS	616	1,745	3,026	25,794	49,055	15,679	132,411	1,360	229,686

VEGETATION TABLE 7

DENSITY-VOLUME INDEX OF VEGETATIONAL QUADRATS ADJACENT TO THE TURKEY POINT CANAL SYSTEM
TRANSECT 5
1978

Species	Quadrat 5A1	5A2	5B1	5B2	5C1	5C2	5D1	5D2	Totals
Aster sp.	present		7	2	2		4		15
Baccharis glomerufolia				present					
Cladium jamaicensis	956	2,369	663	1,858	441	3,812	1,573	451	12,123
Conocarpus erecta	243		7,182	14,176	1,419	1	106		23,127
Eleocharis cellulosa							21	272	293
Ipomoea saggittata			1				present	present	1
TOTALS	1,199	2,369	7,853	16,036	1,862	3,813	1,704	723	35,559

VEGETATION TABLE 8

DENSITY-VOLUME INDEX OF VEGETATIONAL QUADRATS ADJACENT TO THE
TURKEY POINT CANAL SYSTEM
TRANSECT 6
1978

Species	Quadrat								Totals
	6A1	6A2	6B1	6B2	6C1	6C2	6D1	6D2	
Acrostichum aureum		31	3,148						3,179
Aster sp.				1					1
Baccharis sp.						10			10
Blechnum serrulatum	3,696	122				209			4,027
Causuarina equisetifolia	present	95,173		70,423		1	2		165,599
Cephalanthus occidentalis									
Chameysyce sp.						present			
Chiococco alba		present			present	present			
Cladium jamaicensis	1,104	2,290	9,800	2,235	.991	29	4,790	5,605	26,844
Conocarpus erecta		23	14,129	23		702	204	13	15,094
Cyperaceae							present		
Dichronena floridensis							present		
Dipholis salicifolia								18,750	18,750
Eugenia buxifolia							1,772		1,772

VEGETATION TABLE 8
(continued)
DENSITY-VOLUME INDEX OF VEGETATIONAL QUADRATS ADJACENT TO THE
TURKEY POINT CANAL SYSTEM
TRANSECT 6
1978

Species	Quadrat								Totals
	6A1	6A2	6B1	6B2	6C1	6C2	6D1	6D2	
Eugenia confusa						1,026		218	1,244
Ilex cassine		1,566							1,566
Jacquemontia reclinata						present	present	present	
Lantana involucrata							5	16	21
Laguncularia racemosa			51						51
Magnolia virginiana					400				400
Metopium taxiferum		1	11		3,409	21,688	11,132	98,452	134,693
Myrica cerifera	present	10,289			15		150	270	10,724
Passiflora subserosa								present	
Persea borbonia						1,838			1,838
Phlebodium sp.					present				
Pinguicula pumila							present		
Pluchea rosea							present		
Randia aculeata						92	2	400	494

VEGETATION TABLE 8
(continued)
DENSITY-VOLUME INDEX OF VEGETATIONAL QUADRATS ADJACENT TO THE
TURKEY POINT CANAL SYSTEM
TRANSECT 6
1978

	Quadrat								
Species	6A1	6A2	6B1	6B2	6C1	6C2	6D1	6D2	Totals
Rapanea guianensis	28	355			6,542	1	1,044	106	8,076
Rhizophora mangle		6,970							6,970
Rhus sp.						present			
Sabal palmetto	78,400		36,125		3,520	present			118,045
Schinus terebithifolius	present		9,943			25			9,968
Solanum blodgettii	11	13	137		214	213	24	124	736
Solidago microcephala							144		144
Swietiennia mahogani					74,471	477,669			552,140
Torrubia longifolia					9,126	173		present	9,299
Trema micrantha					91				91
Vittaria sp.					present				
Vitis rotundifolia						present	present	present	
Xyris brevifolia							present		
TOTALS	83,239	116,833	73,344	72,682	98,779	503,676	19,269	123,954	1,091,776

VEGETATION TABLE 9

DENSITY-VOLUME INDEX OF VEGETATIONAL QUADRATS ADJACENT TO THE TURKEY POINT CANAL SYSTEM
TRANSECT 7
1978

Species	Quadrat								
	7A1	7A2	7B1	7B2	7C1	7C2	7D1	7D2	Totals
Aster sp.		present		1	1	224			226
Baccharis sp.	present	1							1
Borrichia frutescens							1	1	2
Cladium jamaicensis	1,793	770	1,335	1,288	4,958	1,029		21	11,194
Conocarpus erecta		2,136		1,575	80	16	6	1,022	4,835
Distichlis spicata							861	20,668	21,529
Hypericum sp.		present		present					
Ipomoea saggittata		present			present	present			
Laguncularia racemosa							14	87	101
Xyris sp.		present							
TOTALS	1,793	2,907	1,335	2,864	5,039	1,269	882	21,799	37,888

VEGETATION TABLE 10

DENSITY-VOLUME INDEX OF VEGETATIONAL QUADRATS ADJACENT TO THE
TURKEY POINT CANAL SYSTEM
TRANSECT 8
1978

	Quadrat								
Species	8A1	8A2	8B1	8B2	8C1	8C2	8D1	8D2	Totals
Acrostichum aureum				3,288					3,288
Borrichia frutescens								1	2
Casuarina equisetifolia	7,000	11,281		51,200					69,481
Cladium jamaicensis	575	216	8,563	3,634	1,620	1,824			16,432
Conocarpus erecta	259	1,675	1,816	3,993	2,503	106	4		10,356
Cuscuta sp.						1			1
Distichlis spicata							4,613	43	4,656
Hypericum sp.						1			1
Juncus roemerianus	150	128	215		43		72		608
Laguncularia racemosa			302	30,095		2,505	1,483	303,195	337,580
Rhizophora mangle			9,934	37		97	9	48	10,125
Salicornia virginica							69	present	69
Solanum blodgettii				167		3			170
TOTALS	7,984	13,300	20,830	92,414	4,166	4,537	6,251	303,287	452,769

VEGETATION TABLE 11

DENSITY-VOLUME INDEX OF VEGETATIONAL QUADRATS ADJACENT TO THE TURKEY POINT CANAL SYSTEM
TRANSECT 9
1978

Species	Quadrat 9A1	9A2	9B1	9B2	9C1	9C2	9D1	9D2	Totals
Acrostichum aureum	2,714								2,714
Aster sp.			1						1
Baccharis angustifolia					5				5
Borrichia arborescens	42								42
Borrichia frutescens	22	present	4	present			2		28
Cladium jamaicensis			201		495	65			761
Conocarpus erecta	9,025	6	136		662	506			10,335
Distichlis spicata		63	14	15	1,071	37	76	55	1,331
Juncus roemerianus						43			43
Laguncularia racemosa	42,364	477	3	present	10		244	914	44,012
Rhizophora mangle	42,360	578	229	4,953	157	2,141	4,014	2,051	56,483
Schoenus nigricans		277	249	48	83	2			659
TOTALS	96,527	1,401	837	5,016	2,483	2,794	4,336	3,020	116,414

VEGETATION TABLE 12

ANALYSIS OF ALL TRANSECTS
TURKEY POINT PLANT
1978

Factor level	Degrees of freedom	Sum of squares	Mean square	Calculated F	$F_{.05}$	$F_{.01}$
Transects	8	121.7×10^9	15.21×10^9	2.82	2.33	3.17
Quadrats	3	4.984×10^9	1.661×10^9	0.31	2.92	
Interaction	24	137.7×10^9	5.738×10^9	1.06	1.89	
Error	36	193.6×10^9	5.738×10^9			

VEGETATION TABLE 13

ANALYSIS OF GRASSLAND TRANSECTS
TURKEY POINT PLANT
1978

Factor level	Degrees of freedom	Sum of squares	Mean square	Calculated F	$F_{.05}$
Transects	2	53.29×10^9	26.65×10^9	2.25	3.89
Quadrats	3	26.02×10^9	8.672×10^9	0.73	3.49
Interaction	6	84.11×10^9	14.02×10^9	1.18	3.00
Error	12	142.0×10^9	11.83×10^9		

VEGETATION TABLE 14

ANALYSIS OF WOODY TRANSECTS
TURKEY POINT PLANT
1978

Factor level	Degrees of freedom	Sum of squares	Mean square	Calculated F	$F_{.05}$
Transects	2	24.63×10^6	12.32×10^6	0.76	3.89
Quadrats	3	134.4×10^6	44.79×10^6	2.74	3.49
Interaction	6	197.6×10^6	32.93×10^6	2.02	3.00
Error	12	195.7×10^6	16.31×10^6		

VEGETATION TABLE 15

ANALYSIS OF SOUTHERN TRANSECTS
TURKEY POINT PLANT
1978

Factor level	Degrees of freedom	Sum of squares	Mean square	Calculated F	$F_{.05}$
Transects	2	12.14×10^9	6.071×10^9	1.42	3.89
Quadrats	3	9.024×10^9	3.008×10^9	0.70	3.49
Interaction	6	23.21×10^9	3.868×10^9	0.90	3.00
Error	12	51.45×10^9	4.288×10^9		

VEGETATION TABLE 16

FOUR-YEAR COMPARISON OF GRASSLAND TRANSECTS
TURKEY POINT PLANT
1975-1978

Factor level	Degrees of freedom	Calculated F for year			
		1975	1976	1977	1978
Quadrats	3	25.72[a]	1.77	1.33	2.25
Transects	2	30.69[a]	4.53[a]	0.59	0.73
Quadrats x transects	6	24.29[a]	1.26	0.73	1.18
Error	12				

[a]Significant at F = .05.

VEGETATION TABLE 17

FOUR-YEAR COMPARISON OF WOODY TRANSECTS
TURKEY POINT PLANT
1975-1978

Factor level	Degrees of freedom	Calculated F for year			
		1975	1976	1977	1978
Quadrats	3	2.65	0.51	0.34	0.76
Transects	2	0.26	0.42	0.32	2.74
Quadrats x transects	6	4.05[a]	1.65	0.58	2.02
Error	12				

[a]Significant at F = .05.

VEGETATION TABLE 18

FOUR-YEAR COMPARISON OF SOUTHERN TRANSECTS
TURKEY POINT PLANT
1975-1978

Factor level	Degrees of freedom	Calculated F for year			
		1975	1976	1977	1978
Quadrats	3	48.83[a]	10.32[a]	1.32	1.42
Transects	2	37.59[a]	13.56[a]	4.40[a]	0.70
Quadrats x transects	6	25.58[a]	6.36[a]	3.72[a]	0.90
Error	12				

[a]Significant at F = .05.

3. ANNUAL AERIAL PHOTOGRAPHS (ETS 4.2.2.1)

Due to consistently overcast skies, the annual aerial infrared photograph for 1978 was not taken until February, 1979. Because of this delayed accomplishment, the photographs have not yet been analyzed and are therefore not included with this report. The analysis will be submitted in a supplementary report by April 30, 1979.

IV. CHANGES IN SURVEY PROCEDURES (ETS 5.4.1(3))

None

V. STUDIES NOT REQUIRED BY THE ETS (5.4.1(4))

A. DILUTION PUMPING PROJECT

The Turkey Point plant condensers have experienced non-biological calcium carbonate scaling to such a degree that unit efficiencies have been impacted. A dilution test was conducted in 1978 to examine the effectiveness of adding sea water from Card Sound to the cooling canal water as a means of diluting calcium concentration in the cooling water.

Dilution water was pumped over the closure dam into the cooling canal system from Card Sound Canal. It mixed with cooling system water as it flowed north toward the plant intake.

Pumping began July 25, 1978 and continued through early November, 1978. Three pumps, each with a nominal output of 100 cfs were used; however, this capacity was rarely reached by any of the pumps. Average pumping rates were approximately 200 cfs or less throughout the test.

The ground water monitoring program was reviewed with the South Florida Water Management District (SFWMD) prior to initiation of this test and temporarily augmented for the brief test period. No changes to FPL's official agreement

with SFWMD were made. This augmented program showed no evidence of adverse changes in the ground water regime as a result of the dilution test.

The effectiveness of the test for reducing calcium carbonate scaling is still being evaluated.

VI. VIOLATIONS OF THE ETS

A. I & E REPORT #50-250/50-251/78-22

One item of non-compliance was cited in I & E Report #78-22. This involved review of the groundwater monitoring schedule by FPL in conjunction with the South Florida Water Management District and the USGS. Appendix B Technical Specification 4.A.2.a (prior to Amendments 41 and 33 to OL #'s DPR-31 and DPR-41) required that this review occur quarterly. Contrary to this, the review was being performed semiannually. Amendments 41 and 33, issued by NRC Office of Nuclear Reactor Regulation, on November 6, 1978 deleted the required frequency for review.

VII. UNUSUAL EVENTS, CHANGES TO THE PLANT, ETS, PERMITS OR CERTIFICATES

A. NPDES PERMIT

A renewed NPDES permit was issued by EPA for the Turkey Point Plant, NPDES No. FL0001562, on June 14, 1978. This permit became effective on July 1, 1978 and will expire at midnight on September 30, 1980. A copy was forwarded to the NRC office of Nuclear Reactor Regulation with FPL letter # L-78-380.

B. AMENDMENTS 41 AND 33 TO OL #'s DPR-31 and DPR-41

The subject amendments revise in its entirety, Appendix B to OL #'s DPR-31 and DPR-41. The amendments reduce the requirements of the environmental monitoring program based on data collected during five years of plant operation, remove reference to various studies that have already been completed, make several administrative changes, and delete the monitoring programs and limiting conditions for open-cycle operation.

C. REPORTABLE EVENT NO. 250/251-B-78-01

This event involved the discovery of a breach in the intake area dam. This breach has been repaired. A full account was given in the subject report.